Claims

1. A ship hull, especially intended for oil and chemical ships, passenger ships and fishing ships, comprising an inner hull made of steel or aluminium built on a supporting structure of frames, stringers and longitudinals, and an outer hull, **characterised in** that

between the inner hull and the outer hull a cellular plastic material is applied having chiefly closed cells for improved buoyancy and energy absorbing capability,

the outer hull is made of a high strength steel, and

at external strain, the outer hull and the cellular plastic material are adapted to jointly constitute an energy absorbing deformation zone.

2. A ship hull according to claim 1, **characterised in** that the outer hull and the cellular plastic material are adapted such that in the case of external strain, said deformation zone absorbs enough stress to make the inner hull collapse or break before the outer hull.

3. A ship hull according to claims 1 or 2, **characterised in** that the thickness of the cellular plastic material is adapted to the total weight of the ship in order to obtain buoyancy.

4. A ship hull according to any of claims 1-3, **characterised in** that the thickness of the cellular plastic material is 0,05-3,0 m, and the thickness of the high strength steel is 0,005-0,030 m.

5. A ship hull according to any of claims 1-4, **characterised in** that the cellular plastic material is expanded polypropylene, expanded polythene, expanded PVC, expanded polystyrene, expanded PET, cross linked or non-cross linked materials, and preferably a particle foam of expanded polypropylene (EPP), optionally

having a thermosetting plastic as the adhesive, or merely being heat welded together, wherein stiffeners may be arranged in the cellular plastic material, or a correspondingly enhanced stiffness in one direction in the cellular plastic material.

6. A ship hull according to any of claims 1-5, **characterised in** that the cellular plastic material is glued on the outside of the inner hull.

7. A ship hull according to any of claims 1-6, **characterised in** that the outer hull is glued on the cellular plastic material.

8. A ship hull according to claim 6 or 7, **characterised in** that the glue used is a glue that forms a dilatation joint during hardening.

9. A ship hull according to any of claims 1-8, **characterised in** that at least one highly elastic layer is further arranged between the inner hull and the outer hull, functioning as a membrane.

10. A ship hull according to claim 9, **characterised in** that the material in the highly elastic layer is rubber, an elastomer or a polymer.

11. A ship hull according to claim 9, **characterised in** that the highly elastic layer is formed by a glue used for gluing together the hull and the cellular plastic material.

12. A method of manufacturing a ship hull according to any of claims 1-11, comprising an inner hull made of steel or aluminium built on a supporting structure of frames, stringers and longitudinals, and an outer hull, **characterised in** that a layer

of cellular plastic material mainly having closed cells is attached to the inner hull and a high strength steel layer acting as the outer hull,

and at external strain the outer hull and the cellular plastic material are adapted to jointly constitute an energy absorbing deformation zone.

13. A method according to claim 12, **characterised in** that the outer hull and the cellular plastic material are adapted such that in the case of external strain, said deformation zone absorbs enough stress to make the inner hull collapse or break before the outer hull.

14. A method according to claim 12 or 13, **characterised in** that blocks of cellular plastic material with closed cells are glued to the inner hull, a steel plate is glued to the cellular plastic material, and the steel plates glued to the cellular blocks are welded together to form an outer hull.

15. A method according to claim 14, **characterised in** that blocks of a cellular plastic material having a glued layer of high strength steel are glued to the inner hull.

16. A method according to any of claims 12-15, **characterised in** that

a construction is provided between the inner hull and the outer hull fixing the hulls to each other at a desired mutual distance, however being weaker than said supporting structure of the inner hull, in order to form a gap, or

when rebuilding a double hull, an existing construction between the inner and outer hulls is adapted such that said construction is weaker than the supporting structure of the inner hull, and that

in the gap between the inner and outer hulls a cellular

plastic forming material is injected, preferably cellular plastic spheres together with an adhesive, wherein said cellular plastic layer is formed attaching to the inner and outer hulls.

17. A method according to any of claims 12-16, **characterised in** that the cellular plastic material layer is designed with a thickness of 0,05-3,0 m, and the high strength steel is designed with a thickness of 0,005-0,030 m.

18. A method according to any of claims 12-17, **characterised in** that the cellular plastic layer is selected as having a density of 60-400 kg/m^3 including the adhesive, appropriately at the most 200 kg/m^3, preferably 100-150 kg/m^3.

19. A method according to any of claims 12-18, **characterised in** that the hull surfaces inwards facing the gap are pre-glued with a glue giving rise to a dilatation joint or visco-elastic glue joint, such as a dual component polyurethane glue, epoxy resin and moisture-hardening single component polyurethane glue or different types of prepegs.

20. A method according to any of claims 12-19, **characterised in** that expanded polypropylene, expanded polythene, expanded polystyrene, expanded PET, expanded PPO, expanded PVC, or mixtures thereof is selected as the expanded plastic spheres.

21. A method according to any of claims 12-20, **characterised in** that a thermosetting plastic or any other hardening adhesive is used as the adhesive.